

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

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*Ex parte* MICHAEL J. D'ELIA, BARRY SHEFFIELD,  
RAYMOND BRANSTETTER, AND JAYENDRA BHAKTA

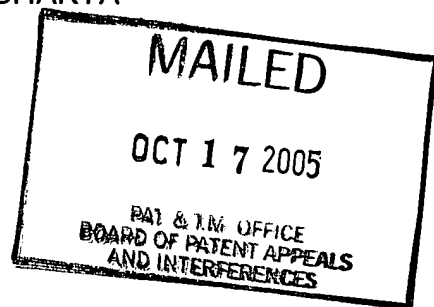
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Appeal No. 2005-0539  
Application No. 09/575,349

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ON BRIEF

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Before JERRY SMITH, BARRY, and LEVY, *Administrative Patent Judges*.  
BARRY, *Administrative Patent Judge*.

A patent examiner rejected claims 18-30. The appellants appeal therefrom under 35 U.S.C. § 134(a). We reverse.

**I. BACKGROUND**

The invention at issue on appeal concerns chemical vapor deposition ("CVD") of a coating on an semiconductor wafer. In a typical CVD, a reactant gas is introduced to a chamber containing a semiconductor wafer. (Spec. at 1.) The gas is decomposed and reacted at a surface of the wafer to form a thin film of material such as silicon nitride, silicon dioxide, or polycrystalline silicon. (*Id.* at 1-2.)

Heretofore, the appellants found it difficult to form a film of a uniform thickness. For example, as reaction products are pumped from a CVD chamber during the manufacture of a semiconductor wafer, the pumping may unevenly draw reaction gasses from parts of the chamber, which in turn degrades the deposition conditions. (*Id.* at 2.) When certain portions of the CVD chamber experience an insufficient supply of gas, the portions can become unsuitable for CVD. Fewer semiconductor wafers can be processed in the chamber, which decreases output and increases time, materials, labor, and expense. (*Id.* at 2-3.)

Consequently, the appellants' invention is aimed at forming a uniformly thick coating on the surface of a semiconductor wafer (220) in the CVD arrangement (200) shown in Figure 1 of their specification. More specifically, an injector (210) supplies a gas to a surface of the wafer that is located in a zone that would exhibit a depleted gas supply absent the injector. Because of a decreased reactant concentration in the gas and decreased gas residence times, for example, a wafer located near the arrangement's exhaust (235) would exhibit variations compared to a wafer located away from the exhaust. "One way in which a uniform gas supply is obtained involves the injector . . . including outlet holes (215) facing away from respectively associated wafers such that the gas exits the injector . . . toward the reactor tube wall." (Appeal Br. at 3.)

The wall helps disperse the injected gas uniformly by preventing a direct blast of gas at the wafer. The injected gas is then used in combination with reactants to deposit a coating on the wafer. "Other embodiments include an anti-reflective coating having a  $k$  value of refractive index between 0.6 and 0.8, adjusting the gas injector to maintain a uniform gas supply, including a gas concentration detector, removing the gas concentration detector prior to depositing the coating, and detecting the concentration of the supplied gas while operating the CVD arrangement under simulated processing conditions." (*Id.*)

A further understanding of the invention can be achieved by reading the following claims.

18. A system for forming a coating on a surface of a semiconductor wafer in a CVD arrangement, the system comprising:

injector means for supplying a uniform supply of gas to the surface of the wafer, the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector means; and

means for using the supplied gas in combination with selected reactants to deposit a coating on the wafer.

19. A method for forming a coating on a surface of a semiconductor wafer in a CVD arrangement, the method comprising:

supplying gas to the surface of the wafer using a gas injector adapted to maintain uniform supply of the gas in a zone of the CVD

arrangement that would exhibit a depleted gas supply absent the injector;  
and

using the supplied gas in combination with selected reactants and  
depositing a coating on the wafer.

Claims 18-21, 26, and 27 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,015,330 (issued May 14, 1991) ("Okumura"). Claims 22-25 stand rejected under 35 U.S.C. § 103(a) as obvious over Okumura and U.S. Patent No. 5,710,073 (issued Jan. 20, 1998) ("Jeng"). Claims 28-30 stand rejected under § 103(a) as obvious over Okumura and U.S. Patent No. 6,143,080 (issued Nov. 7, 2000) ("Bartholomew").

## II. OPINION

Our opinion addresses the following issues:

- anticipation and obviousness
- indefiniteness.

### A. ANTICIPATION AND OBVIOUSNESS

Rather than reiterate the positions of the examiner or the appellants *in toto*, we focus on the main point of contention therebetween. The examiner asserts, "as shown in figs. 8 and 1[5] of Okumura et al. if either the injector 92 or one of the injectors 25

were absent, respectively, from the arrangement, a depleted gas supply zone will be formed in the CVD arrangement and that uniform supply of gas to the surface of the wafer could not be maintained." (Examiner's Answer at 9.) The appellants argue that the examiner "fail[s] to identify where the '330 reference teaches . . . specifically the limitations directed to the process of the individual wafer surfaces ('the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector means'). . . ." (Appeal Br. at 9.)

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987) (citing *Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 715, 223 USPQ 1264, 1270 (Fed. Cir. 1984); *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548, 220 USPQ 193, 198 (Fed. Cir. 1983); *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed. Cir. 1983)). Furthermore, "[t]o establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (quoting *Continental Can Co. v. Monsanto*

Co., 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991)) "Inherency . . . may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Oelrich*, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981) (citing *Hansgirk v. Kemmer*, 102 F.2d 212, 214, 40 USPQ 665, 667 (Cust. & Pat.App. 1939)).

Here, Okumura "relates to . . . forming a film through a thermal CVD (Chemical Vapor Deposition) process." Col. 1, ll. 7-10. As aforementioned, the examiner cites to two Figures of the reference. Figure 8 "is a diagram for explaining a vertical type heat treatment device to which this invention is applied." Col. 9, ll. 60-62. "Referring to this diagram, 81 [is a] reaction container." *Id.* at ll. 62-63. "A wafer boat 86 having many wafers 85 as target objects stacked thereon is accommodated in the inner cylindrical tube 83 [of the reaction container 81]. The wafer boat 86 is placed on a boat support 88 which is provided rotatable by a wafer rotating mechanism 87." Col. 10, ll. 3-7.

"At the side wall of the reaction container 81 at the bottom portion thereof are a process gas inlet 89 and a reactive gas inlet 90." *Id.* at ll. 8-10. "L-shaped gas outlet tubes 91 and 92 have their gas outlet portions provided in the space between the inner cylindrical tube 83 and the a [sic] column of wafers 85, and

have their distal end portions respectively inserted in the process gas inlet 89 and the reactive gas inlet 90." *Id.* at ll. 17-21. Consequently, gas outlet tubes 91 and 92 respectively inject process gas and reactive gas.

Although the examiner asserts that without the outlet tube 92, "a depleted gas supply zone will be formed in the [reaction container 81]," she identifies no teaching thereof in the reference. Nor does the examiner establish that the reaction container 81 would **necessarily** exhibit such a zone of depletion absent the gas outlet tube. To the contrary, even without the gas outlet tube 92, the wafer boat 86 would still be "rotated during a treatment." Col. 11, ll. 53-54. "Accordingly, the density of the . . . reactive gas contacting the individual wafers 85 [may still] become uniform. . . ." *Id.* at ll. 54-56.

For its part, Figure 15 of Okumura "illustrat[es] the structure of a plasma processing device utilizing an active gas transporting system." Col. 4, ll. 34-36. "Disposed in a substantially spherical reaction container made of quartz is a heating table 23 on which a semiconductor wafer 22 as a target object is placed to be heated. A pair of process gas inlets 25 for introducing a process gas such as an N<sub>2</sub> or

O<sub>2</sub> gas are provided at respective end portions of the reaction container 21." Col. 2, ll. 53-59.

Although the examiner asserts that without both process gas inlets 25, "a depleted gas supply zone will be formed in the [reaction container 21]," (Examiner's Answer at 9), she identifies no teaching thereof in the reference. Nor does the examiner establish that the reaction container 21 would **necessarily** exhibit such a zone of depletion absent one of the gas inlets. Therefore, we reverse the anticipation rejection of claims 18-21, 26, and 27.

"In rejecting claims under 35 U.S.C. Section 103, the examiner bears the initial burden of presenting a *prima facie* case of obviousness." *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993) (citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992)). "A *prima facie* case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976)).



Here, the examiner does not allege, let alone show, that the addition of Jeng or Bartholomew cures the aforementioned deficiency of Okumura. Therefore, we reverse the obviousness rejections of claims 22-25 and 28-30.

#### B. INDEFINITENESS

Under 37 C.F.R. § 41.50(b) (2005), we enter a new ground of rejection against claims 18-30. "[I]t is only fair (and statutorily required) that competitors be able to ascertain to a reasonable degree the scope of [a] patentee's right to exclude."

*Markman v. Westview Instruments Inc.*, 52 F.3d 967, 978, 34 USPQ2d 1321, 1329 (Fed. Cir. 1995) (citing *Merrill v. Yeomans*, 94 U.S. 568, 573-74 (1877)).

Consequently, the second paragraph of 35 U.S.C. § 112 requires that a specification conclude "with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."

Here, independent claim 18 recites in pertinent part the following limitations: "injector means for supplying a uniform supply of gas to the surface of the wafer, the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector means. . . ." Similarly, independent claim 19 recites in pertinent part the following limitations: "supplying gas to the surface of the wafer using a gas injector

adapted to maintain uniform supply of the gas in a zone of the CVD arrangement that would exhibit a depleted gas supply absent the injector. . . ."

Both claims 18 and 19 **require** the use of a gas injector. Regarding the former claim, for example, the appellants emphasize that the "indirect-gas-supply structure corresponding to the claimed injector 'means" is directed to the structure of an injector positioned in the CVD arrangement so that the outlet or outlets face the reactor tube wall with the reactor tube wall reflecting the gas evenly across the wafer surface." (Appeal Br. at 8.) The independent claims further recite a zone that would only exist **absent** the required gas injector. Neither claim 18 nor claim 19, moreover, is written as in a Jepson<sup>1</sup> type format (37 CFR § 1.75(e)) and MPEP § 608.01(m). Because one limitation, viz., the zone, is claimed in terms of the absence of another limitation that must exist, viz., the gas injector, the metes and bounds of the claims cannot be readily ascertained. Therefore, we reject claim 18; claim 19; and claims 20-30, which depends from claim 19, as indefinite under 35 U.S.C. § 112, ¶ 2.

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<sup>1</sup> *In re Jepson*, 357 F.2d 406, 409-410, 148 USPQ 736, 739 (CCPA 1966)

### III. CONCLUSION

In summary, the rejection of claims 18-21, 26, and 27 under § 102(b) is reversed. The rejections of claims 22-25 and 28-30 under § 103(a) is are also reversed. A new rejection of claims 18-30 under § 112, ¶ 2, is added. 37 C.F.R. § 41.50(b) provides that "[a] new grounds of rejection pursuant to this paragraph shall not be considered final for judicial review." Section 41.50(b) also provides that, within two months from the date of the decision, the appellant must exercise one of the following options to avoid termination of proceedings of the rejected claims:

- (1) Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .
- (2) Request that the proceeding be reheard under 37 C.F.R. § 41.52 by the Board upon the same record. . . .

No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a).

37 C.F.R. § 41.50(b)

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